BOTANICAL GAZETTE.

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Botanical Papers before the American Association.

The following is a full list of the papers entered upon the programme of the Association devoted to or touching upon botanical topics:

W. O. ATWATER, On the assimilation of atmospheric nitrogen by plants.

V. BALL, On the identification of the animals and plants of India which are mentioned by ancient Greek authors.

W. J. BEAL, The torsion of leaves; and Polarity of leaves of Erigeron Canadense.

C. E. BESSEY, The adventitious inflorescence of Cuscuta glomerata.

LOUIS ELSBERG, Demonstrations of perforations in the cellulose walls of plant-cells.

R. HITCHCOCK, Remarks on fluid and gelatinous media for cultivating micro-organisms.

JAMES HYATT, A discussion of the principles involved in the general action of vegetation, and of trees especially, to prevent extremes of temperature.

JOS. F. JAMES, Affinities of Dionæa.

WM. R. LAZENBY, The influence of cross fertilization upon the development of the strawberry.

GEO. MACLOSKIE, Stomates on seeds.

LILLIE J. MARTIN, A botanical study of the mite gall on the petiole of Juglans nigra, known as Erineum anomalum Schw.

THOMAS MEEHAN, On the extinction of species.

C. S. MINOT, Biological problems; and Researches on growth and death.

H. N. MOSELEY, Utricularia vulgaris with young teleostean fishes entrapped in the bladder-traps.

ALFRED SPRINGER, Fermentation without combined nitrogen.

GEO. M. STERNBERG, Methods of cultivating micro-organisms.

E. LEWIS STURTEVANT, Influence of insulation upon vegetation.

L. F. WARD, The fossil flora of the globe; historical view, geological view, botanical view.

We are doubtless justified in saying that from a strictly botanical stand-point, none of these reached a high plane of scientific importance, unless we except the last one. Quite a number of them, however, were not intended as contributions to botanical science, and their value is to be judged by other standards. Some of the papers were not read, owing to the absence of the authors when the papers were called, and others were not heard by the editors. The following items are all our space will permit.

We are enabled to give elsewhere an abstract, prepared by the author, of Prof. Ward's valuable paper on fossil botany. It excited much interesting discussion, in which Mr. Carruthers drew attention to the necessity of caution in using the determinations of many fossil forms, especially of those below the Devonian. Many of the monocotyledons of the earlier periods are now known positively to be fragments of forms of other groups. The cryptogams of the Carboniferous strata, and other archæan types, had often undoubtedly peculiar vegetative structures, but their reproductive organs were not materially different from the forms of the present time, and they will all fall into groups established upon living forms. Prof. Ward in replying said there were at present three great schools of paleobotanists: the English, represented by Mr. Carruthers and Mr. Stevenson, the French, represented by M. Saporta and others, and the Swedish school, each with its special views. Prof. Macloskie mentioned the great gap that undoubtedly exists just before the almost simultaneous appearance of the Apetalæ, Polypetalæ and Gamopetalæ. Mr. John Ball pointed out that very likely the originals of the dicotyledons were largely lost through unfavorable conditions for their preservation.

The papers of Dr. Minot called forth a vigorous discussion between botanists and zoologists and between American and English scientists. He said in the first paper that the Linnæan system of nomenclature in its original significance has really become obsolete, although the majority of naturalists may not be aware of the fact, and based this statement on the gradual approximation of the number of species to the number of genera. Mr. Carruthers dissented from this view, and said that on the

other side the Atlantic the Linnæan system was in as full force as it was in the days of its author. Dr. Gray fully concurred in this opinion, and doubted if the proportion of genera to species had much changed since Linnæus' time. He also said that the binary system was made for botanists, was kept by them, modified by them, and even to-day serves them as well as a system can well do. The time may come when zoologists will again adopt the true Linnæan system of genera, preserved in its purity by botanists. Prof. Cope said the Linnæan use of genera in zoology was not so strictly adhered to as in botany.

The second paper by Dr. Minot treated of individuality, as influenced by death, and whether death is coextensive with life. Prof. Huxley has said that the whole group of cells springing from a single cell forms one individual, i. e. one cycle of cell life. But if this is a universal definition, then death does not occur among many of the protophyta and protozoa, for they keep up a continuous life by successive divisions. Death is possibly a development that arises along with the differentiation of the higher forms. Mr. Meehan used the sunflower to show that the cycle of life is only a matter of nutrition, for while it usually dies in one year, cuttings may be taken which will continue the growth for another year, and so on. This is true of many other plants. Mr. Alpheus Hyatt had been unable to accurately apply the term individual, so used the new term zoon in the same manner as phyton is used in botany. Dr. Gray said individuality is a matter which is striven after in the organic world, is arrived at in the animal kingdom, but probably only fully achieved in the conscious animal. Several other equally eminent authorities spoke upon the subject.

Miss Martin comes to the conclusion from her study of the walnut *Erineum* that the gall starts very early in the growth of the petiole, and that the development is inward, as shown by the position of the eggs of the mite, and the absence of any sign that the tissues have been pierced. The paper received the special commendation of Dr. Gray.

Prof. Macloskie said that stomata had been reported on the seeds of *Magnolia* and *Lilium speciosum*, to which he added *Polygala*, *Viola*, *Carya*, *Juglans*, *Caulophyllum*, *Fagus*, and *Arisæma triphyllum* on the accessory coat.

Prof. Bessey had found by close examination of young plants of *Cuscuta glomerata* that the inflorescence arose from crowded adventitious buds, and not from the repeated branching of axillary flower-branches, as is commonly stated.

The Botanical Club of the A. A. A. S.

The success which attended the first meetings of the Club at Minneapolis, gave promise of greater success when it became possible to somewhat obviate the inconvenience of being a wholly subordinate appendix of a great body whose movements could not always be foretold with certainty. This was partly accomplished at Philadelphia, and yet the Club found itself considerably hampered for want of a convenient hour for meeting, and means for giving full notice to its members. But so much porgress was mad› in securing suitable arrangements, that we may anticipate that a year or two more will find the Club with ample facilities for carrying on its work.

The meetings were held in the Hall of the Union League, the room where the biological section of the Association met. The first meeting, at 9 o'clock Friday morning, Sept 5, was called to order by the President, Prof. Beal, of the Agricultural College of Michigan. The Secretary being absent, Prof. Arthur was chosen to fill his place. About thirty were present After several announcements were made, a paper was read by Dr. N. L. Britton, of Columbia College, "On the Composition and Distribution of the Flora of New Jersey." He described the topography of the state in its relation to the distribution of the vegetation, and spoke of the rarer forms in the several regions. The present number of plants known in the state is about as follows: exogens, 1168 species and 76 varieties; endogens, 483 species and 50 varieties; gymnosperms, 12 species; ballast plants, 400 spe›ies; pteridophytes, 365 sp›cies and 75 varieties; charas, 10 species; lichens, 240 species and 62 varieties; fungi, about 1500 species; marine algæ, 110 species and 4 varieties; fresh water algæ, 510 species; diatoms, 450 species; protophytes, about 125 species; making the large total of nearly 5,500 species. The catalogue of the State is being prepared for the Geological Survey; a preliminary one was issued in 1881, and the final one is expected in about a year hence.

At 5 o'clock in the afternoon of the same day, the second meeting was held, about 40 being present. Prof. Barnes, of Purdue University, read a paper on the "Course of the Fibrovascular Bundles in the Leaf Branches of Pinus sylvestris," in which he attempted to throw some light upon the nature of the peculiar bundles in the leaves of pine and other conifers Each leaf has what might be taken to be two bundles, separated and surrounded by peculiar tissue, the whole enclosed in a bundle

sheath, outside which lies the usual green mesophyll. By examining the early stages in the stem, it was found that they divided first at right angles to the plane of the leaves, and afterwards each half again divides, and sends a branch to each leaf. But this does not yet wholly clear up the matter. The paper excited considerable interest, and was discussed by Profs. Buckhout, Macloskie and others.

A paper by Prof. C. E. Bessey, of the Iowa Agricultural College, gave observations on the "Mode of Opening of the Flowers of Desmodium sessilifolium." They expand to a certain degree, and remain in that position till a particular spot at the base of the standard is touched, when the wings and keel drop down suddenly, the stamens are protruded, and the insect is dusted on the breast with pollen. As the stigma is thrust out in front of the anthers, in the next flower visited, it touches the pollen-covered surface of the insect before the pollen of the same flower is deposited.

Prof. Geo. Macloskie, of Princeton, followed with observations on the "Fertilization of Geranium maculatum." It is protandrous. He found that heavy insects, like bumble bees, pull the flower down, and in the efforts to hold on the pollen is rubbed upon the insect, which in like manner is deposited on the exposed stigmas of the next flower visited.

Prof. W. R. Dudley, of Cornell University spoke of the "Torsion of Stems of Eleocharis rostellata," and also on "The Protogynous Character of some Myriophyllums." Some discussion followed on torsion in this and other instances.

Prof. W. H. Seaman, of Washington, advocated the use of oblique sections in studying the fibro-vascular bundle. The protest which Prof. Bessey entered against this method for the purpose of exact study will doubtless meet the approval of most workers. Prof. Seaman also spoke of the peculiar terminations of certain bundles in the leaves of Chenopodium and Drosera.

The third meeting was held at 9 A. M. Monday, with about 25 present. Prof. Beal, the President, read a paper "Concerning the Manner in which Certain Seeds bury themselves beneath the Soil," by means of their long hygroscopic awns. He found they succeeded as well on a free surface as among grass or stubble. The discussion that followed was participated in by Profs. Rothrock, Bessey and others.

Prof. W. R. Lazenby, of the Ohio University, presented a paper on the "Prolificacy of Certain Weedy Plants," based upon the number of seeds found by actual count to be produced by an average plant.

Prof. J. T. Rothrock, of the University of Pennsylvania, made some interesting remarks on Photomicrography. He said that one with an ordinary microscope was within twenty dollars of photographing. By the dry plate process an hour's practice would enable one to get a picture of some kind, and such as would lead to something better. Some photographs of wood sections were passed about to illustrate how he used this in class work. He laid much stress upon the necessity of very thin sections in all microscopic work.

The same speaker then made some remarks on the significance of "Loments of Leguminous Plants."

Dr. Gray, holding a sunflower in his hand, said Mr. Meehan had made an interesting discovery in these flowers. Instead of the pistil pushing the pollen out of the anther tube by its gradual lengthening, as had always been supposed, he found that the stamens and pistil grow together till of full length, then the filaments shorten, and the anther tube is drawn down, exposing the pistil covered with pollen, which then displays its stigmatic surfaces in the well known way. This fact is connected with the observation of Kölreuter and other older observers, that in Centaurea and some thistles, if the tips of the anther tubes are touched at the right moment, they will quite suddenly retract, which only differs from this instance of the sunflower in the time occupied by the movement. Mr. Meehan, who is inclined to see things from a somewhat different point of view from most of us, thinks this a provision for self-fertilization. But bees undoubtedly carry the pollen from one head to another. A considerable discussion followed, in which Prof Beal suggested the experiment of covering up the heads to see if any seed would set. Dr. Gray thought they would probably form, for many flowers failing to secure cross-fertilization were yet able to self-fertilize. Mrs. Wolcott, of Boston, confirmed this opinion. She had covered up the heads to keep birds away, and had obtained plenty of seeds.

The club met at the usual hour Tuesday morning. Mr. P. H. Dudley, of the Torrey Club, exhibited some fine photomicrographs of wood.

Dr. Geo. Vasey, of the U. S. Department of Agriculture, gave some interesting "Notes on the Vegetation of the Arid Plains."

Prof. Bessey spoke of the "Curvature of the Stems of Conifers," having seen branches of Austrian pine bend that were one, two, and even three years old.

Mr. Meehan discussed the "Relationship of Helianthus annuus and H. lenticularis," two species which have now been thrown together in the Synoptical Flora, the latter being considered the wild and the former the cultivated state of the common sunflower. He exhibited charts to show that *H. annuus* has a campanulate corolla, while that of *H. lenticularis* is tubular, as Nuttall had recognized in naming it *H. tubæformis*. Other differences are not so constant.

The same speaker then adverted to the retraction of the stamens in the sunflower by means of the elastic filaments. He contended that as the bees distributed pollen from one floret to another of the same head, it only constituted self fertilization, according to Mr. Darwin's definition. Mr. Carruthers, of the British Museum, spoke in commendation of the careful observations which the speaker had made.

The next paper by Prof. L. M. Underwood, of Syracuse University, on "Some Statistics Concerning the North American Hepaticæ" gave the distribution by states and regions, and the number of species in the orders: Ricciaceæ 24, Marchantiaceæ 22, Anthoceroteæ 14, and Jungermanniaceæ 171, making a total of 231 species. Of these 120 are peculiar to America, only 39 of which are commonly found in public herbaria, and 60 are probably not represented in any American collection, public or private.

Miss Grace Anna Lewis, of Philadelphia, showed a chart of the vegetable kingdom to learn if it were constructed on right principles.

The final meeting of the club was held on Wednesday morning at 9 o'clock. The first paper, by Prof. J C. Arthur, was on the "Nature of Gumming or Gummosis in Fruit Trees." He considers it to be a deorganization of the tissues through the influence of a fungus, but not necessarily a specific one. A fungus in this connection was first described last year by Oudemans in Hedwigia under the name Coryneum Beyerinckii. The speaker had been able to produce gumming by Monilia fructigena the fungus of rotting fruit, and the bacteria of pear blight, and showed specimens caused by the latter.

The report of the committee on postal matters was then called for. The committee was appointed last year at Minneapolis, and consisted of Profs. Coulter, Farlow and Bessey. The last was the only member present, who read a long statement from the Postmaster General to the effect that the present law could not be construed to allow botanical specimens to be accom-

panied by the usual written labels except at letter rates of postage, but expressing a willingness to bring the matter to the attention of the law makers at the proper time. The report was discussed, and upon motion the committee was continued. Prof. Barnes moved that the officers of the club draft resolutions to be presented for the approval of the Biological Section of the Association to still further promote the object in view.

The Club then proceeded to the election by ballot of officers for the ensuing year. The first ballot gave for president, Bessey 10, Beal 6, Hyatt 1; for secretary, Arthur 11, Barnes 2, Miss Knight 1, Dudley 1. The president announced that Prof. Bessey had been elected president and Prof. Arthur secretary.

A paper by Dr. Geo. Vasey on "A Hybrid Grass," in the author's absence, was read by the secretary, and is printed in full on another page. In the remarks that followed Prof. Scribner said Muhlenberg, Sprengel and Michaux placed *Eatonia* in *Aira*, which this discovery of Dr. Vasey showed to be not far wrong. *Graphephorum melicoides* and *G. Wolfii* might also be placed in the group *Avenaceæ*. The genus *Graphephorum* is an anomalous one, and the species should doubtless be distributed.

The Club then adjourned. The following papers were on the programme of the Club, but were not heard for want of time: "Notes on a Peculiar Flora on the Kittatinny Mountains," by Dr. N. L. Britton; "A New Preservation Fluid Especially Valuable for Plant Tissues," by Prof. C. V. Riley; Note on the Germination of Grasses," and "A Point in the Structure of the Sterile Flowers of Silphium," by Prof. C. E. Bessey; "The Fertilization of Wheat," by Prof. W. R. Lazenby.

Excursions and Entertainment of the Botanists at Philadelphia.

The prediction that the meeting of the American Association this year would bring together a large and notable attendance of botanists was fully realized. Indeed, they began to arrive as early as Saturday preceding the opening of the Association. The total attendance reached a little above one hundred, of whom six were from Great Britain. Full half the number have more than a local reputation, including a majority of our most distinguished teachers and investigators.

The arrangements for the benefit of the botanists were as elaborate and complete as could have been wished. The efforts

of the committee of arrangements appointed by the Botanical Club were heartily seconded by the botanical section of the Academy of Sciences, who arranged the financial matters, a no small item, and both before and during the meeting were constantly at hand to render assistance. But to one person, Mr. J. H. Redfield, more than to any other individual, we owe the thorough success of the arrangements. Before the meeting he left no avenue untried that promised to afford additional enjoyment for the occasion, and during the meeting gave the same assiduous attention to the consummation of every detail. The heat was one feature of the occasion which produced so much discomfort that it can not be passed by in silence. It was intense and constant, both day and night, causing many to leave before the close of the session, and greatly enervating those who remained.

The Academy of Sciences was the headquarters of the botanists, where they met a hearty welcome, and found the library, collections, and other facilities of the institution placed at their service. It proved somewhat too far for convenience from the rooms of the Association, and the heat made the distance seem doubly long.

The excursion of Saturday to the pine barrens was, barring the heat, thoroughly enjoyable. The crossing of the ferry, the bustle of starting, and the ride gave opportunities for much fragmentary intercourse. When the coach which was devoted to the botanists was left on the side track at Egg Harbor the view that greeted the eye was a level sandy plain with low vegetation, interspersed with shrubs and trees here and there, and a few houses in the foreground. It was determined to make a sally eastward first. In spite of the fact that the thermometer had undoubtedly passed above the nineties, the whole party of 50, including ladies and Britishers, wandered out for a mile or so amid a vegetation remarkably rich in showy and interesting flowers and botanical rarities. But the heat would not permit much loitering, and they soon returned with red faces, but arms full of treasures. After a short rest all but a few summoned up fortitude to start out again, going westward for a full mile along the railroad track. This gave a different flora. But the zeal of the excursionists, which was emulating the temperature, reached its highest point when the cry ran all along the line that the Schizæa was found. There was a succession of disappearing forms down the railroad embankment into the thicket, where all, great and small, went down on hands and knees to gather the

precious little ferns of such unfern-like aspect. But it is impossible to tell all that happened, and we must pass by numerous interesting incidents. A bounteous lunch was served upon the return, after which Mr. Martindale called the botanists to order, Prof. Beal presided, and remarks were make by several members of the party. Dr Gray gave some reminiscences of his early visits to this region. He thought it was in 1832 that in company with Dr. Torrey he first saw the pine barrens at Tom's River, and had found *Schizæa*. The following year he spent a week at Quaker's Bridge, and had not been in the pine barrens since till the present occasion. Mr. Carruthers spoke pleasantly of the enjoyment which the day had afforded him, and his surprise to see a region so apparently barren supporting such a varied vegetation, particularly at this season of the year. He was only able to recognize Pteris and Osmunda regalis as plants he had previously seen in a living state. Prof. Crawford, of Scotland, Prof. Porter, of Pennsylvania, and others spoke, when, the train arriving, we were on our way again, visiting the seashore for a breath of salt air, and then back to Philadelphia. It was a thoroughly successful excursion in many respects. In the matter of collecting, flowering plants were abundant and interesting, but we did not learn how many were secured, lichens were numerous, 83 species being gathered, fungi less abundant, 14 species being gathered, but water and moisture-loving plants largely absent. It was a surprise to most to see the vivacity of the older botanists. Dr. Gray was everywhere, and more active and less affected by the heat and the tramping than many of the young men, and Mr. Carruthers's genial face was also constantly with us.

On Monday morning those of the botanists who expressed a desire to visit the famous "ballast grounds" at Camden were met at the Market street ferry by Dr. J. B. Brinton, who was provided with a liberal supply of ferry tickets, and insisted upon distributing them to all who wished to go over. Arriving at the other side, we were met by Mr. Isaac C. Martindale, who ushered us into a four-horse coach. After the arrival of the last boat load, we were whirled off to the American Dredging Company's wharf, where we had our first opportunity to collect the many foreign plants which have established themselves on the ballast grounds. Starr's wharf and the Narrow Guage R. R. wharf yielded still other species. Among those picked up by the party were *Cnicus acanthoides*, *Verbena officinalis* (a new invoice, just over), *Convolvulus arvensis*, *Atriplex rosea*, *Reseda*

lutea, *Diplotaxis tenuifolia*, *Linaria spuria*, *Lycopus Europæa* (typical), *Atriplex hastata*, *Chenopodium vulvaria*, *Amarantus blitum*, *Coreopsis bidentoides*, *Lotus corniculatus*, etc. Some of these named are well established in other parts of the country, but it was interesting to see the exact way in which they were, many of them, introduced. By the time the party had skirmished over the three localities, the sun began to grow hot—a gentle reminder of the pine-barren experience—and our host gave the order for the return. In a few minutes we were landed at the door of his hospitable home on Penn street, where Mrs. Martindale, with several other ladies, were waiting to receive us. After looking over the many rare and valuable books—some of them almost priceless—which Mr. Martindale has gathered into his library, the company were glad to heed an invitation to the dining room, where an elegant lunch was spread, such as never before had tickled the palates of "wharf rats," such as we that morning. After lunch, Mr. M. displayed some of the treasures of his herbarium and explained the plan adopted in its arrangement—a plan which provides for unlimited growth without the necessity of complete overhauling at each considerable addition. His herbarium is one of the largest (if not the largest) private herbaria in the country, and certainly no method of arrangement could surpass his for facility of reference and ease of handling.

After spending a most delightful hour or two, the party were driven to the ferry and returned to the work of section F in the afternoon. Those who participated in the excursion to the ballast grounds will undoubtedly all say that no excursion of the meeting was more enjoyable or enjoyed than this

It is said that the social privileges are highly important features of these gatherings, and, granting this, we are ready to maintain that the reception of Monday evening, given by the Botanical Section of the Academy of Sciences at their rooms, stands among the first of the notable events of the session. As many as 300 sat down to listen to the brief formal exercises of the evening. After the adjournment of an extremely short regular meeting of the Botanical Section of the Academy, Dr. Gray was called to the chair, Mr. Martindale acted as Secretary, and addresses were given by Messrs. Vasey, Canby, Meehan, Macloskie, Rothrock, Bessey, John Ball, Carruthers and Redfield. These were brief and pithy, and interspersed with such felicitous and suitable remarks by the presiding officer as to make the occasion a memorable one. The chatting and feasting that followed is not to be described, but resulted in all the satisfaction such an occasion may bestow.

On Tuesday afternoon the botanists of the Association joined the members of the Botanical Section of the Academy of Natural Sciences in a visit to the first Botanical Garden in the United States, established by one of the earliest botanists of this country, John Bartram, on the bank of the Schuylkill about three miles below Philadelphia. When the train stopped at the 58th Street Station, about 80 red badges disembarked, and under the guidance of several members of the Academy, set out for the historic spot. Changes of road since the last visit somewhat misled the guides and the party, and when the road suddenly ended blindly at a seven-rail fence, there was nothing for it but a climb. The ladies, however, took the fence in a style that indicated that they had had some previous experience on sundry collecting trips. A short cut across pastures and barn-lots soon brought us to the desired haven, though not by the most delightful traveling withal.

Coming from the railroad, one approaches the house from the rear as it faces the Schuylkill. The party first halted before a stone in the gable bearing the inscription, in quaint letters,

ΘΕΟΣ ΕΩΖΩ.
JOHN ANN: BARTRAM: 1731.

A larger one on the front of the house, over the window of his study, recites the simple creed for which he was disciplined by the Society of Friends:

'TIS GOD ALONE, ALMYTY LORD,
THE HOLY ONE BY ME ADORD.
JOHN BARTRAM—1770.

This house is built of stone, a gneissoid granite apparently quarried, hewn and laid by Bartram's own hand. In the center is a large recess porch, the roof of which is supported by columns with carved capitals of the Elizabethan order. The stone casings and sills of the windows are also carved in odd designs, and with evident patience. These ornamentations together with the whole make up of the building show that Bartram was a mason of no mean attainments.

The great interest of the garden to botanists lies as much in the wonderful array of plants from all parts of the U. S. almost, which this indefatigable collector got to growing here. Clambering over the corner of the house is the famous Christ's thorn, whose horrid spines bring to mind the bleeding brows of the Savior. The great Cypress planted in 1749 is said to be 150 feet high. Three feet above the ground it meaaures 21 ft. 5 in. in circumference, and near the base fully 30 feet. Some descendants of Bartram's oak, *Quercus heterophylla*, Michx., are grow-

ing in the garden, the original tree which stood outside having been cut down many years ago by mistake. After inspecting the house and the cypress, the party scattered, roaming through the grounds at pleasure, noting the great variety of trees and shrubs which Bartram had collected in his travels from Ontario to Florida [1]

The return to the station was along a better road than the first one traversed, and toward train time the party gathered on the steps of the station to chat over the delightful pilgrimage, soon completed by the homeward ride.

A Hybrid Grass.[2]

BY DR. GEO. VASEY.

In a low meadow on the banks of Hunting creek, near where it empties into the Potomac river, a mile below Alexandria, Va., I found, the present season, *Trisetum palustre*, L. and *Eatonia Pennsylvanica*, Gr. I was surprised, and puzzled also by finding growing with these grasses another, which was evidently intermediate between them. The field covered several acres, and there was an abundacne of specimens of all kinds, although the *Trisetum* was mostly out of flower, and, to a considerable extent, had dropped its seed. A careful survey of the circumstances led me to the conclusion that the intermediate form was a true and spontaneous hybrid between the *Trisetum* and *Eatonia*. At first thought this would seem to be improbable, if not impossible, as the two grasses belong to different genera, which in some of the classifications are rather widely separated. A careful examination, however, led me to the conclusion that these genera are closely related, and that the intermediate specimens were truly hybrids between the two species named. The close relationship between *Koeleria* and *Eatonia* is very evident, the two species of the latter genus having been included in *Koeleria* previous to the construction of the genus *Eatonia* by Rafinesque. Both species had, however, been placed in *Aira* by Muhlenberg. Moreover, Dr Hooker, in the Handbook of the New Zealand Flora, places both *Koeleria* and *Trisetum* in the section *Avenaceæ*, and the

[1] An account of Bartram's life, travels, and garden may be found in Harper's Magazine for February, 1880.

[2] Paper read before the Botanical Club of the A. A. A. S., Philadelphia, 1884.

same relationship is maintained by European agrostologists. Even in Bentham and Hooker's *Genera Plantarum*, w' e e the two genera are placed in different sections, there is one group of *Koeleria* described, in which the flowering glume is short-awned, several species of which group were by Trinius placed in *Trisetum*

As to the two species named, *Trisetum palustre* and *Eatonia Pennsylvanica*, it may be said that both grow in similar situations, both have the same general habit and appearance, growing to about the same height, with similar foliage, and the same kind of long, narrow and loose panicle. Both have about two flowers in the spikelet, the outer glumes are very similar in form, texture, nervation and relative size, and nearly the same may be said as to the flowers.

When we come to minutia, however, there are differences. The spikelets of *Eatonia* are about $1\frac{1}{2}$ lines long, the obovate upper glume about 1 line long; the lower flower is about $1\frac{1}{4}$ lines long, the upper one about 1 line, both linear and obtusish. The axis connecting the flowers is smooth or nearly so. In *Trisetum* the spikelet is about 3 lines long, the obovate-lanceolate upper glume about 2 lines long, with scarious margins, the lower flower 2 to $2\frac{1}{2}$, and the upper slightly shorter; and the upper flower has a bent awn 2 to 3 lines long, proceeding from the apex between the two acuminate lateral teeth, the lower flower being unawned or barely mucronate. The flowering glumes are linear-lanceolate and 3 nerved, the lateral nerves indistinct below. The axis connecting the flowers is sparingly hairy.

Examining now the intermediate or hybrid form, we find the spikelets about 2 lines long, the outer glumes about $1\frac{1}{2}$ lines, the lower one linear-lanceolate, acute, 3 nerved; the upper glume is obovate-oblong, acute, 3 nerved, with scarious margins. The flowering glumes are linear, $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long, 3 nerved, the lateral nerves obscure; the lower flower is acute or acutish, the upper one with 2 *short* lateral teeth, and an awn about 1 line long. The axis is slightly hairy, less so than in *Trisetum*.

In all these characters there is an intermediate gradation of the two species.

The finding of these hybrid specimens recalled to my memory the fact that 7 or 8 years ago, I found, mixed with specimens of *Eatonia Pennsylvanica* collected by Mr. A. H. Curtiss in South Carolina, almost exactly the same hybrid form, although I did not then realize their relationship.

The conclusion which I draw from these cases is that *Eatonia* and *Trisetum* are very closely related, and should both be in the section *Avenaceæ*, as also should some species of the genus *Graphephorum*.

NOTES[1] BY F. L. SCRIBNER.—The above paper, in which Dr. Vasey details a discovery made by himself, describes an undoubted instance of hybridization between *Trisetum palustre* and *Eatonia Pennsylvanica*.

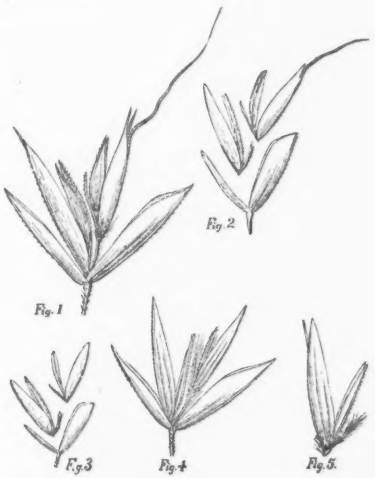

Fig. 1. Trisetum palustre. Fig. 2. Hybrid between the preceding and the following. Fig. 3. Eatonia Pennsylvanica. Figs. 4 and 5. Graphephorum melicoides.

Figures 1, 2 and 3 are magnified drawings of the spikelets of the three forms in question, all enlarged to the same scale, showing the relative size and proportions of the various parts. Figure 2, the spikelet of the "hybrid," it will be seen, is intermediate in size between the *Trisetum* and *Eatonia*, illustrated by Figures 1 and 3, respectively. In general shape and texture of the outer glumes and florets it resembles the last named, but the flowering glumes are awned as in the *Trisetum*. Whether the

[1]Remarks made at the reading of the paper, prepared by the author and sactioned by Dr. Vasey.

seeds of this "hybrid" are fertile or whether it produces seeds at all was not stated.

This discovery of Dr. Vasey's is an exceedingly interesting one, and apparently fixes the position of the genus *Eatonia* in the Avenaceous group, as indicated by Dr. V., along with *Trisetum*, to which genus it was once, and as now appears very properly, referred by Trinius If we examine the synonomy of this grass —*Eatonia*—we find that Dr. Vasey's paper confirms the opinion of the older botanists as to its position: Michaux, Pursh, Sprengel, Muhlenberg and Willdenow placing it in *Aira*, Desveau and Roemer and Schultes in *Airopsis*. Beauvois doubtfully referred it to *Poa*, and Kunth founded upon it the genus *Reboulea*, placing it in *Poaceæ* along with *Glyceria*, and this classification has been followed by Dr. Gray and by Mr. Bentham.

Dr. Vasey alludes to the very evident Avenaceous character of certain species of *Graphephorum*, referring to *G. melicoides* and *G. Wolfii* (*Trisetum Wolfii*, Vasey in Wheeler's Report). Figure 4 represents a spikelet of *G. melicoides*. Like *Trisetum palustre* it is two-flowered, with a similar prolongation of the rhachilla above the second floret; there is a like inequality of size in the empty glumes, and the hairiness of the rhachilla differs only in degree, and, although the flowering glume is awnless in the typical form, we occasionally find samples that are short-awned, as represented in Fig. 5.

Graphephorum Wolfii presents some specific differences in habit, and has a narrow and more densely flowered panicle, but the spikelets are very similar to *G. melicoides* in all their parts, differing chiefly in being three, or, in the more robust forms (*Trisetum Brandegei*, Scribn.), four-flowered, with the flowering glume constantly short-awned. Prof. Thurber, in the Botany of California, referred this grass to *Trisetum subspicatum* (*T. subspicatum*, var. *muticum*), while another well-known botanist referred samples of it to *Graphephorum melicoides*. Dr. Vasey himself thought at one time that it might be only a variety of the last-named species. In respect to other species of the genus *Graphephorum*, as it now stands, I would like to quote from a letter from Dr. Vasey dated April, 1881, and I hope the Doctor will pardon me for taking this liberty when I say that I heartily second the views he expresses:

"*Graphephorum fulvum* and *pendulinum* I would restore to *Colpodium*, and place next *Glyceria*. *Graphephorum festucaceum* I would call *Fluminia arundinacea*, Fries., and think it belongs to the group *Festucaceæ*

"*Graphephorum flexuosum*, only doubtfully referred to *Graphephorum* by Prof. Thurber, is neither one nor the other, but a good genus.

Graphephorum melicoides should be *Trisetum melicoides*, or if a genus (*Graphephorum*) be made for it, it should come next to *Trisetum* or *Avena*, for it is evidently Avenaceous."

The Fossil Flora of the Globe.[1]

BY LESTER F. WARD.

HISTORICAL VIEW.—The writers of antiquity make no mention of any form of vegetable petrification. The earliest allusion to the subject was made by Albertus Magnus in the thirteenth century. Agricola and Gesner treated of petrified wood in the sixteenth century. The first mention of any kind of vegetable impression in the rocks was made by Daniel Major, of Jena, in 1664. In 1699 Edward Lhwyd, of London, wrote an extensive treatise on such impressions. He maintained that they were the remains of plants that had perished in the Noachian deluge. In 1709 Scheuchzer, of Switzerland, defended this view in his "Herbarium Diluvianum," a large work, in which he described and figured many fossil plants, referring them to species living in Europe. In 1718 this author went so far as to classify the fossil plants according to the system of Tournefort. In 1723 he published a new edition of the "Herbarium Diluvianum," into which he introduced this classification, and enumerated 445 species. A powerful reaction against this method followed; comparisons with living plants were carefully made, which failed to establish the identity of the fossils. The idea of their exotic origin was thereupon suggested, and for a time prevailed, but towards the close of the eighteenth century this in turn gave way to the true view of the existence of the former geologic periods with floras of their own differing from that of the present. Baron von Schlotheim headed this new school, and was followed by Count Sternberg and Adolphe Brongniart, who jointly founded the science of vegetable paleontology in the first quarter of the present century.

The first attempt to place it upon the footing of a systematic

[1]Abstract, prepared by the author, of a paper read before the A. A. A. S., Philadelphia, 1884.

science was made by Rev. Henry Steinhauer, of Bethlehem, Pennsylvania, in a paper read before the American Philosophical Society, and published in its "Proceedings" for the year 1818. In this paper he described and figured ten species of Waller's genus *Phytolithus*, which was made to embrace nearly all forms of vegetable fossils. Two years later Schlotheim, in his "Petrefactenkunde" applied specific names to 78 fossil plants. Brongniart, in his "Prodrome," published in 1828, went much farther. He referred many fossil plants to living genera, and created a largen umber of new extinct genera. He enumerated 501 species, many of which were fully characterized and thoroughly illustrated in his "Histoire des Végétaux Fossiles."

A census of fossil plants was taken by Unger in 1845, which showed that the number of known species had increased to 1,648. In 1848 Göppert made a similar enumeration, and found 2,055 species. The extraordinary activity that followed in the developing of new fossil floras rendered it possible for Schimper, in 1874, to describe about 6,000 species in his great work, "Traité de Paléontologie Végétale." The decade which has elapsed since the appearance of that work has witnessed extensive investigations in this field, particularly in the arctic regions and in the United States, and the number of fossil species now known to science is probably between eight and nine thousand.

GEOLOGICAL VIEW.—The most ancient vegetable remains known are two species of *Oldhamia* from the Cambrian of Ireland. From the Lower Silurian 44 species, chiefly marine algæ, have been named. Among these, however, are included the earliest terrestrial forms, viz., *Eopteris Morierei*, Sap., *Sphenophyllum primœvum*, Lx., and two other vascular plants from the Cincinnati Group. Of the 13 species of the Upper Silurian, five are vascular plants, and these include *Cordaites Robbii*, Dawson, from Hérault. The Devonian furnish 188 species of fossil plants, in which ferns play the leading rôle, while from Permo Carboniferous strata nearly two thousand species are known. Only 67 species are found in the whole of the Trias. With the Rhetic a new impulse is felt increasing to the Oolite, in which 419 species occur. The Upper Jurassic and Lower Cretaceous are sparingly supplied with the remains of vegetation, but in the Cenomanian, to which the beds of Atane, Greenland, and our own Dakota Group of Kansas and Nebraska are referred, nearly 500 species of fossil plants have already been found. The Turonian, with its probable equivalent in the west, the Fort Benton Group, is

nearly destitute of vegetable remains, but the Senonian immediately overlying it, with which the Canadian geologists have correlated certain rich plant beds of British Columbia, and to which Heer's flora of Patoot, Greenland, must be referred, yields more than 350 species. The Laramie Group of the western United States is thought to be extreme Upper Cretaceous. This is very rich in plants, and 333 species have already been described from this horizon.

The Tertiary flora is much more abundant than even that of the Carboniferous. The Eocene furnishes nearly 800 species (including our Green River Group and the Paleocene beds of Sezanne and Gelinden). The Oligocene of Europe yields a somewhat larger number. The maximum is attained in the Miocene, from which more than three thousand fossil plants are known. The Miocene practically closes the geological series so far as vegetable paleontology is concerned. Only about 150 Pleiocene species exist, and a still smaller number from the Quatenary.

BOTANICAL VIEW.— I. First appearance of types.

The Oldhamias of the Cambrian, mentioned in the last paper, are classed as marine algæ of the order *Florideæ*. The ferns, *Equisetineæ*, and *Lycopodineæ* all appeared in the Lower Silurian. One species of *Cordaites*, which is now regarded as the ancestral type of *Coniferæ*, occurs in the Upper Silurian. The *Rhizocarpeæ*, according to Dawson, existed in the Devonian of Canada and Brazil.

The *Cycadaceæ* and the Monocotyledons have their earliest known representatives in the Carboniferous. The order *Gnetaceæ* is represented, according to Heer, in the Oolite of Siberia by his species *Ephedrites antiquus*. The Dicotyledons first appear in the Urgonian of Kome, Greenland, through Heer's single species *Populus primæva*. All three of the divisions of dicotyledonous plants occur in great abundance in the Cenomanian. If the genus *Selaginella* is regarded as belonging to the *Ligulatæ*, this small transitional type also first appears in the Cenomanian, at Atane, Greenland.

All the leading types of vegetation are thus introduced without going later down the geological scale than the middle Cretaceous.

II. Age of maximum relative predominance of each type.

The marine algæ, of course, being the only vegetation, were supreme during the Cambrian and early Silurian. The maximum relative predominance of each of the other principal types was reached as follows: The ferns in the Permian, the *Equiset-*

Number of Species of each of the Principal Types of Vegetation that have been present time, as nearly as it is possible to ascertain, together with the

	Geological Formations.	Cryptogams											
		Cellular.		Vascular.									
				Ferns.		Rhizocarpeæ.		Equisetineæ.		Lycopodineæ.		Ligulateæ.	
		No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.
	Present time	35,000	23.89	3,000	2.05	100	0.07	30	0.02	500	0.34	400	0.27
Cenozoic.	Quaternary	27	33.3	4	4.9	.....	.....	2	2.5	.....	.....	.....	.....
Cenozoic.	Tertiary. Amber	37	55.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cenozoic.	Tertiary. Pliocene	.....	.....	3	3.1	.....	.....	.....	.....	.....	.....	.....	.....
Cenozoic.	Tertiary. Miocene	138	5.5	87	2.9	6	0.2	18	0.6	.....	.....	2	0.06
Cenozoic.	Tertiary. Oligocene	17	2.2	17	2.2	1	0.1	3	0.4	.....	.....	.....	.....
Cenozoic.	Tertiary. Green River	5	2.2	8	3.5	2	0.9	3	1.3	1	0.4	1	0.4
Cenozoic.	Tertiary. Eocene	71	10.3	23	3.2	.....	.....	1	0.2	.....	.....	.....	.....
Cenozoic.	Tertiary. Paleocene	3	2.5	7	5.9	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Cretaceous. Laramie	13	3.9	23	6.9	1	0.3	4	1.3	1	0.3	3	0.9
Mesozoic.	Cretaceous. Senonian	22	6.5	73	20.6	.....	.....	1	0.3	.....	.....	.....	.....
Mesozoic.	Cretaceous. Turonian	1	20.0	1	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Cretaceous. Cenomanian	8	3.3	38	15.5	1	0.4	1	0.4	.....	.....	1	0.4
Mesozoic.	Cretaceous. Dakota	1	0.5	7	3.3	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Cretaceous. Gault	.....	.....	10	27.8	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Cretaceous. Urgonian	.....	.....	50	46.3	1	0.9	3	2.8	1	0.9	.....	.....
Mesozoic.	Cretaceous. Necomian	10	25.6	12	30.8	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Jurassic. Wealden	7	5.8	44	36.4	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Jurassic. Coral	19	29.2	12	18.4	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Jurassic. Oolite	39	9.3	133	31.7	1	0.3	14	3.3	3	0.7	.....	.....
Mesozoic.	Jurassic. Lias	13	9.7	44	32.8	.....	.....	4	3.0	.....	.....	.....	.....
Mesozoic.	Jurassic. Rhetic	8	6.3	69	54.3	.....	.....	5	3.9	.....	.....	.....	.....
Mesozoic.	Trias. Keuper	.....	.....	15	36.6	.....	.....	3	7.3	.....	.....	.....	.....
Mesozoic.	Trias. Muschelkalk	2	33.3	1	16.7	.....	.....	.....	.....	.....	.....	.....	.....
Mesozoic.	Trias. Bunter Sandstein	.....	.....	7	31.9	.....	.....	1	4.5	.....	.....	.....	.....
Paleozoic.	Permian	6	1.8	186	55.4	.....	.....	26	7.7	9	2.7	.....	.....
Paleozoic.	Carboniferous	17	1.2	627	42.4	.....	.....	143	9.7	368	24.9	.....	.....
Paleozoic.	Sub-carboniferous	5	3.7	64	47.4	1	0.8	20	14.8	25	18.5	.....	.....
Paleozoic.	Devonian	33	17.6	79	42.0	3	1.6	16	8.5	28	14.9	.....	.....
Paleozoic.	Upper Silurian	8	61.5	2	15.4	.....	.....	1	7.7	1	7.7	.....	.....
Paleozoic.	Lower Silurian	40	90.9	1	2.3	.....	.....	1	2.3	2	4.5	.....	.....
Paleozoic.	Cambrian	2	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

ineæ and the *Lycopodineæ* in the Carboniferous, the *Cycadaceæ* in the Lias or Oolite, the *Coniferæ* in the Wealden or Neocomian, the Monocotyledons in the Eocene, the monochlamydeous Dicotyledons in the Cenomanian, the polypetalous Dicotyledons in the Miocene, and the gamopetalous Dicotyledons in the present living flora of the globe.

III. Probable true period of origin and of maximum absolute development of each type.

found Fossil in each Geological Formation; also, the number existing at the percentage that each type forms of the total flora of each formation.

PHÆNOGAMS.														
GYMNOSPERMS.						ANGIOSPERMS.								Total.
Cycadaceæ.		Coniferæ.		Gnetaceæ.		Monocotyledons		Dicotyledons.						
								Apetalæ.		Polypetalæ.		Gamopetalæ.		
No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	No.	p. c.	
75	0.05	300	0.24	40	0.03	20,000	13.65	12,000	8.19	35,000	23.89	40,000	27.31	146,445
2	2.5	4	4.9	.....	.....	.....	.....	27	33.3	8	9.9	7	8.7	81
.....	.....	14	20.9	1	1.5	2	3.0	5	7.5	1	1.5	7	10.4	67
.....	.....	13	13.3	.....	.....	9	9.2	32	32.6	31	31.6	10	10.2	98
6	0.2	250	8.2	1	0.04	272	8.9	826	27.1	1,064	35.0	346	11.3	3,046
2	0.3	64	8.3	1	0.1	82	10.6	256	33.1	259	33.6	70	9.1	772
.....	.....	10	4.4	.....	.....	21	9.2	85	37.1	73	31.9	20	8.7	229
3	0.4	34	4 9	.....	.....	116	16.8	162	23.5	221	82.1	59	8.6	689
.....	.....	1	0.8	.....	.....	7	5.9	57	47.9	39	32.8	5	4.2	119
1	0.3	15	4.5	.....	.....	33	9.9	125	37.5	84	25.2	30	9.0	333
5	1.4	34	9.6	.....	.....	18	5.1	118	33.3	64	18.1	18	5.1	354
.....	.....	1	20.0	.....	.....	.....	.....	.....	.....	2	40.0	.....	.....	5
11	4.5	28	11.4	.....	.....	6	2.5	61	25.0	82	33.7	7	2.9	244
7	3.3	12	5.6	.....	.....	5	2.4	88	41.3	84	39.4	9	4.2	213
2	5.5	22	61.2	.....	.....	2	5.5	.....	.....	.....	.....	.....	.....	36
21	19.4	25	23.2	.....	.....	6	5.6	1	0.9	.....	.....	.....	.....	108
6	15.4	9	23.1	.....	.....	2	5.1	.....	.....	.....	.....	.....	.....	39
43	35.5	26	21.5	.....	.....	1	0.8	.....	.....	.....	.....	.....	.....	121
17	26.2	17	26.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	65
116	27.7	103	24.6	1	0.3	9	2.1	.....	.....	.....	.....	.....	.....	419
58	43.3	10	7.5	.....	.....	5	3.7	.....	.....	.....	.....	.....	.....	134
26	20.5	18	14.2	.....	.....	1	0.8	.....	.....	.....	.....	.....	.....	127
15	36.6	7	17.1	.....	.....	1	2.4	.....	.....	.....	.....	.....	.....	41
.....	.....	3	50.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
3	13.6	7	31.8	.....	.....	4	18.2	.....	.....	.....	.....	.....	.....	22
14	4.1	92	27.4	.....	.....	3	0.9	.....	.....	.....	.....	.....	.....	336
8	0.5	307	20.8	.....	.....	8	0.5	.....	.....	.....	.....	.....	.....	1,478
.....	.....	20	14.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	135
.....	.....	29	15.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	188
.....	.....	1	7.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2

Cellular Cryptogams of some kind probably lived in the Laurentian, and account for the graphite beds and dark carbonaceous matter of certain Archæan rocks. Being an heterogeneous group their later representatives belonged to entirely different families. If we include the fungi the number of species is probably greater in the living flora than it was at any geological epoch. The ferns, *Equisetineæ*, and *Lycopodineæ* probably all originated in the Lower Silurian, and reached their absolute

maximum in the Carboniferous. The *Cycadaceæ* may have originated as early as the Devonian. They must have attained their absolute as well as their relative maximum development in the middle Jurassic. The *Coniferæ* through their archaic form, the *Cordaiteæ*, began in the Lower Silurian. They attained their full maturity in the Cretaceous, and are now on the decline. The Monocotyledons probably date back to the Lower Carboniferous or Devonian, and reached their highest expression in the palms whose reign occupied the early Tertiary. These also are probably now waning. The Dicotyledons must have had their real origin in the Lower Jura or Upper Trias; their absolute probably coincides with their relative development, the *Apetalæ* being now declining, the *Polypetalæ* about stationary, and the *Gamopetalæ* rapidly advancing.

GENERAL NOTES.

Results of the Philadelphia Meeting.—It is unnecessary to mention those features which are obvious from the nature of the meeting and the large attendance of botanists. Not among the least results was the awakening to united action, which must be still further augmented in order to forward measures of commanding importance which are quite within the scope of the organization.

The action in reference to postage on botanical specimens seems to have been as vigorous and effective as could have been devised. The committee of the Club did their work well. The resolutions drawn up and presented by the officers of the Club to the Biological Section of the Association were as follows:

Resolved, 1st. That the Biological Section of the American Association for the Advancement of Science earnestly request that the Postmaster General recommend to Congress such changes in the existing postal laws as will permit the transmission through the mails of botanical specimens, accompanied with the customary written labels, giving name, locality, date of collection and collector's name, at fourth-class rates of postage.

Resolved, 2d. That he take such action as may be deemed best to secure similar regulations in the transmission of botanical specimens to and from Canada.

Resolved, 3d. That he cause the same subject to be presented before the Congress of the Universal Postal Union at its meeting in Lisbon in October next, in order, if possible, to secure like liberality with foreign countries.

The secretary of the Section was instructed to transmit the same to the to the Postmaster General. Upon the suggestion of the vice-president, Prof. Cope, a motion was carried to have a committee appointed to wait upon the Postmaster General, and personally urge the importance of the measures. The

chair appointed Prof. Ward, of the National Museum, Dr. Vasey, of the Department of Agriculture, and Prof. Chickering, of the Deaf-Mute College.

The desirability of calling attention to the necessity of more extensive investigations on plant diseases, from both an ecomical and scientific view, was the topic of much conversation, but it did not till the last days of the session crystallize into definite shape. The following was finally presented to the Section of Biology: The members of the Botanical Club desire to call the attention of the American Association to the necessity of encouraging researches upon the influences which affect the health of plants, particularly those of fungous origin, and therefore pray that the Biological Section request that a permanent committee be appointed, to be known as a "Committee on the Encouragement of Researches upon the Health and Diseases of Plants," to confer with regard to the best methods by which to advance this object, the first report to be made to the Society at its next meeting. Seven names were suggested for members of this committee. This received the hearty sanction of the Section, and was sent to the Standing Committee, and from them to the General Session of the Association, which established the committee and appointed the following members: J. C. Arthur, C. E. Bessey, W. G. Farlow, T. J. Burrill, J. T. Rothrock, C. H. Peck and W. J. Beal. The marked favor with which the matter was received by members of the Association, both officially and privately, gives much encouragement that important results will be accomplished.

In opposition to these commendatory results, a few failures, or more properly negative results, should be noted. Foremost of these is the low average quality of the botanical papers presented before the Association. Last year the botanists were ten per cent. of the total attendance, and this year eight per cent., or, exclusive of the British, nine per cent., and among them some of the most distinguished names of the science in this country, and yet the botanical communications in no instance exhibit that profund research or comprehensive statement of laws or relationships, or other characteristics that would entitle them to rank with the better papers presented by the zoologists, physicists or chemists. It lies with individual workers to see that this does not remain so. The Botanical Club gives an opportunity for presenting notes and less weighty communications under equally good auspices, and therefore in honor to the science the Biological Section should only be asked to hear what is the most important.

The Club were the recipients of a fine registry book from the local committee of arrangements appointed by the Academy. Nearly 100 names were registered in it, but owing to imperfect methods, due to the newness of the thing, there were conspicuous omissions, and some names entered that ought not to have been. A different system will be devised for the future.

A New Variety of Comandra umbellata, Nutt.—Flowering stem erect, six to ten inches high, several growing from the base of a barren stem, along its upper side; barren stems one to two feet long, decumbent, or from an ascending base, sometimes prostrate; leaves of barren stem rather large, one to two inches long, one-third to five-eighth inch wide, elliptical or lance-ellipti-

cal, somewhat deciduous. May be called *C. umbellata* Nutt. var. *decumbens*, from the habit of its stem. Dry, wooded hills, Poysippi, Wanshara Co., Wis., July, 1883. Perhaps only local.—E. J. HILL, *Englewood, Ill., July 28, 1884.*

A Reply.—*To the Editor of the Botanical Gazette:*—Allow me a word in reference to *Specularia* and *Campanula*. My critic, in the notice of my pamphlet in the September number of the GAZETTE, after quoting me to the effect that the genuine Campanulas have bell-shaped flowers and the Specularias have rotate ones, goes on to say that "it would seem that the original Canterbury Bell is no longer a Campanula!" I confess my inability to understand this. Wood's Botanist and Florist is all I have at hand at present to consult, but he distinctly states that in *Campanula medium*, Canterbury Bells, the flowers are bell-shaped. It would therefore come under *Campanula*, as I have stated it.

Again, in reference to *Specularia*. Wood states that the flowers are "sessile, erect." Gray does not state as to this. But my critic says positively that they are *not* erect. My experience is that they are erect, in opposition, at least, to drooping. Lastly, if there are plenty of species of Campanulas with sessile and rotate flowers, there is all the more reason for the union of the two genera into one. On the whole, therefore, I do not see that I am so very far out of the way after all. The word "suggests" would convey a better idea of the manner in which the suggestion was made than the word "announces," which has a disagreeable sound.—JOS. F. JAMES.

Siphoptychium Casparyi, Rostfki.—In August of last year I found on the surface of a decaying log at Lake Placid, Adirondack mountains, an Æthalium or Compound plant of the Myxomycetes, which presents some interesting features.

Its dimensions were large, being one foot by eighteen inches in diameter in the main portion of the plant, which, with various prolongations additional, gave an area of at least two square feet. Subsequent examination led me to refer the plant to the genus *Siphoptychium*, as far as the genera discription, alone given in Dr. Cook's British Myxomycetes, would permit. This genus is one of the two new genera created by Rostafinski in the supplement to his Monograph, and has not yet been recorded as American. Through the kindness of Prof. Farlow, to whom I referred the plant for identification, I am enabled to append a translation of its specific description, as contained in the Polish Monograph. This description so literally applies to my plant that any further detailed account of it is unnecessary.

Siphoptychium Casparyi, Rostfki. On the strongly developed hypothallus stand collected sporangia, having an angular columnar form in consequence of mutual pressure, and slightly convex at the apex. The tubes of the capillitium issuing from the columella are few in number and develop in rows. The hypothallus, the walls of the sporangia, the columella and the mass of the spores are everywhere umber brown. The spores are finely echinulate, size 7.5 mm.—GEO. A. REX, M. D., *Philadelphia.*

Teratology.—I have before me a most curious case of an abnormal daisy, *Chrysanthemum leucanthemum*. In it there are three heads on the same stem, no

flattened and malformed as in most cases of fasciation, but all placed back to back and with perfect individual involucres. Indeed, the heads are in no way changed except in their strange position, which was so remarkable as to attract the attention of my correspondent, Miss Luther, of Providence, who kindly sent the plants for my examination. The three heads combined form a sort of pyramid. If the cluster is turned in a certain position the observer sees but one disk at a time. It is impossible to view all three at once except from above. I think the malformation quite unique.

Cases of fasciation are common, but perhaps worth noting. Mr. Leland, an enthusiastic collector of this city, found a large specimen of *Lobelia cardinalis*, in which apparently two buds had united to produce a uniformly flattened or ribbon-like stem. This bore normal flowers.

Miss Eloise Butler, of Minneapolis, sends me a specimen of *Arisæma triphyllum* with a double spathe including a single spadix; also a much fasciated stalk of *Linaria vulgaris*, having numerous normal flowers on alternated and leafy-bracted pedicels.

Within a day or two I have seen a garden rose in which, in the center of the rosette of petals, was a perfect but unopened flower bud.—W. W. BAILEY, *Providence, R. I.*

American Æcidia on Ranunculi.—The great difficulty of properly distributing æcidia to their respective teleutosporic forms is well brought out by trying to arrange our species in accordance with foreign investigations. *Uromyces Poæ* and *U. dactylidis* are not known in this country, but a *Puccinia* on *Ranunculus repens* does occur. We have an æcidium on *R. abortivus* known as *Æ. Ranunculi*, and one on *Anemone nemorosa*, both of which have been referred to *Æ. Ranunculacearum*, but without much doubt incorrectly. In fact, the true *Æ. Ranunculacearum* is rare in this country, but occurs, as I am informed by Dr. Farlow, near Boston on *R. acris*. After such excellent investigations as those of Mr. Plowright, we are yet quite in the dark regarding the affinities of our own *Ranunculi* æcidia.—J. C. A.

The Potétomètre.—In Nature, xxx, 79, H. Marshall Ward gives a description and figures of an instrument, the "potétomètre," recently devised by Moll, for measuring the amount of water transpired by plants. The instrument is designed to furnish water to the shoot under experiment at a constant pressure. It consists essentially of a burette, stoppered at the top and expanded into a bulb just above the lower stopper. This bulb has two orifices near its middle, one on the right and another on the left side, at the same height. Into one a capillary glass tube is fixed by means of a caoutchouc or cork stopper and into the other a slender glass tube is permanently soldered. The latter tube is bent into the form of a very broad U and expanded at the distal end into a thimble, into which the shoot to be experimented on is fixed by rubber tubing, so that its lower end is exactly on a level with the capillary tube in the bulb. This capillary tube has a movable plate of polished copper placed at right angles, and near to the end which is within the bulb, for the purpose of regulating the size of the bubbles of air which the tube is intended to admit.

The copper plate serves also to direct the bubbles upward into the tubular portion of the burette. As the water is evaporated by the shoot, the exact amount can be read off, by means of the graduations of the burette. The entire apparatus may be supported by an ordinary burette stand.—C. R. B.

EDITORIAL NOTES.

LUDOVICO CALDESI died at Faenza, Italy, in May last.

GEO. BENTHAM died Sept. 10, at the age of 84.

G. B. DELPONTE, late Professor of Botany in the Univ. of Turin, Italy, is dead.

D. APPLETON & CO. have announced a new series of science text books, including botany.

DR. LARS MAGNUS LARSSON, author of several valuable floras, died in July at Karlstad, Sweden.

IT IS stated in Müller's *Eucalyptographia* that 1½ parts of Eucalyptus oil in 1000 parts of fluid prevents the development of bacteria.

THE NEW BIOLOGICAL laboratories of the University of Pennsylvania are expected to be ready for occupancy in November.

DR. GRAY, Mr. John Ball and Mr. Wm. Canby took a botanical trip to Roan Mountain after the close of the American Association.

PROF. C. E. BESSEY, of Ames, Iowa, has been tendered the chair of botany in the University of Nebraska, and it is rumored that he will accept.

L. H. BAILEY, JR., is writing a series of "Talks About Weeds" for the *American Cultivator*. The fertility of the Canada thistle is discussed in No. 11.

AN IMPORTANT treatise on fungi by Dr. de Bary has just been issued under the title *Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien*.

THE JAPANESE government has made a large and interesting exhibit, both botanically and economically, of the native ligneous flora and its products, at the International Forestry Exhibition now in progress at London.

THE JAPANESE make toothpicks from the wood of the common snowballs, (*Viburnum Opulus*), rope from the stems of the Chinese *Wistaria*, and oil from the seeds of *Camellia Japonica*.

EXPERIMENTS made by A. Adrianowsky of Moscow, given in a late number of the *Botanisches Centralblatt*, showed that diffused daylight had no influence upon the germination of seeds but to retard the process, and the older the seeds the greater the retardation.

A CONSIDERABLE amount of interesting botanical literature annually finds its way into the reports of agricultural and horticultural societies. The following has just come to hand: "A grain of corn," by Prof. C. R. Barnes, in Rep. Ind. Bd. of Agric., 1884. "Two parasitic fungi" and "Functions of the leaf," by Dr. C. E. Bessey, and "Mildew of growing plants," by Prof. J. C. Arthur, in Trans. Iowa Hort. Soc., 1883.

DR. GRAY's paper before the British Association at Montreal was one of the five papers which only will be printed in full in the Proceedings of the Association.

PROF. LESTER F. WARD has published in the Proceedings of the Biological Society of Washington a list of 41 species, to supplement his Flora of Washington.

PROF. FEDERICO DELPINO, well known for his numerous studies on the fertilization of flowers by insects, has accepted a call to the chair of botany in the Univ. of Bologna.

THE BRITISH ASSOCIATION devotes £1,515 the present year to the aid of scientific research, of which biology receives £515, or rather zoology, for not a penny is given to botany.

DR. ASA GRAY, together with several other British and American visitors to the British Association in Montreal, was the recipient of the honorary degree of LL. D. from McGill University.

THE DELIVERY of certain scientific works to the subscribers to circulating libraries of Russia, among which are the writings of Darwin, Huxley, Agassiz, Lubbock and Spencer, has been interdicted by Imperial decree.

A NEW *Saprolegnia* is figured by W. G. Smith, in the *Gardener's Chronicle* for August 23 of current year. It forms an abundant white felt over the gills of bedding mushrooms, and produces oospores only when placed in water.

THE COMMON YARROW, *Achillea Millefolium*, L., as we learn from Mr. Carruthers, of the British Museum, is so much relished by cattle in England, and kept so closely cropped that it is rarely to be seen in pastures, which is contrary to experience in this country.

THE BULLETIN OF THE TORREY BOTANICAL CLUB for August contains a "List of Cyperaceæ," collected by the late Mr. S. B. Buckley in the valley of the Rio Grande, in Texas and northern Mexico. *Cyperus Buckleyi*, *C. oxycarioides* and *Heliocharis Texana* are described as new species.

UNDER THE NAME of Blue Mountain tea, Mr. Meehan, in the *Gardener's Monthly* for September, states that the leaves of *Solidago odora* are quite extensively used as a beverage. It has upon its own merits come to have a commercial value, being sold in the Chicago markets and elsewhere.

THE BOTANICAL PAPERS read at the British Association at Montreal were as follows: On the identification of animals and plants of India which are mentioned by early Greek authors, by V. Ball; On the Jessup collection to illustrate the forestry of the U. S. in the New York Natural History Museum, by A. S. Bickmore; Notes on the occurrence of bacteria on coins, by L. Elsberg; Remark on the characteristic features of North American vegetation, by Asa Gray; Result of the investigation of insular floras, by W. B. Helmsley; On the diatomaceous remains in the lake deposits of Nova Scotia, by A. H. Mackay; Observations on the trapping of young fish by Utricularia vulgaris, by H. N. Moseley.

FROM *Hedwigia* we learn that Baron von Thümen has been obliged on account of his failing health to remove to Görz, Austria, and to discontinue much of his mycologic work. He has concluded to offer the few remaining complete sets of his Mycotheca Universalis (Centur. I–XXII) at 200 marks, being sixty-four marks less than the regular price.

NUMBER TEN of the Memoirs of the University of Tokio is entitled "Phytochemical Notices of Some Japanese Plants," by Prof. J. F. Eykman, of the medical faculty. The following species have been studied: Andromeda Japonica, Scopolia Japonica, Macleya cordata, Chelidonium majus, Nandina domestica, Orixa Japonica, and Skimmia Japonica. The memoir is in German.

THE "LOCO WEED," or one of them at least, is *Astragalus mollissimus*, Torr., according to Prof. T. C. Porter in the *Gardener's Monthly*. Experiments were performed by Dr. Isaac Ott, of Easton, Pa., during 1882, with infusions of this plant received from Western Kansas, and the same effects produced as the stock men of that region ascribe to it. Its active principle is doubtless a powerful poison.

WHILE ATTENDING the American Association, we had the pleasure of examining a number of both the original drawings and proofs of the plates for for Prof. Beal's new work on grasses, and found them of superior quality. The artist is Prof. F. L. Scribner, the agrostologist, whose excellent work should bespeak for him the patronage of other botanists. The engraving is by the Levytype process.

PROF. DR. ALEXANDER FISCHER VON WALDHEIM, President of the Imperial Society of Naturalists in Moscow, died on July 13, at the age of eighty-one years. He is best known in this country by his studies on the development of the *Ustilagineæ*. A translation of an important contribution on this subject to Pringsheim's Jahrbücher für Botanik appeared sometime ago in the Report of the N. Y. Agric. Society.

A NEW MYCOLOGICAL journal is talked of, we hear. It is to bear the highly appropriate name *Schweinitzia*, and like the Italian journal *Michelia*, to be devoted to the publication of new species, and the collected descriptions of particular groups. We wish the enterprise the heartiest support, and suggest that all, who are interested in it, manifest their appreciation by communicating with Mr. J. B. Ellis, Newfield, N. J.

AN INTERESTING description of Michaux's garden at New Durham, N. J., is given by Mr. H. H. Rusby in the *Torrey Bulletin* for August. The site is now largely occupied by a cemetery, and almost no relic remains, the buildings as well as the trees and shrubs having disappeared. The original boundaries, and position of the principal objects were pointed out by the descendants of Michaux's associate, Saunier, who are now living in the vicinity.

THE AMERICAN MICROSCOPICAL JOURNAL warmly endorses the effort of the American Association to create a greater interest in fungous diseases of plants. It says: "The subject is one well worthy of liberal assistance; the

work is of peculiar difficulty, requiring constant attention on the part of the observer, and it is not only necessary to have special laboratories properly furnished for it, but skillful and experienced observers must be engaged, who can give their entire attention to the work." The necessity for Government aid is urged.

THE EDITORS of "Drugs and Medicines of N. A," J. U. and C. G. Lloyd, find it necessary to begin the issue of a four-page supplement to that publication, in which they can make known any new facts, *addenda et corrigenda*, answer questions, collate and present notes, etc. In the first number they ask botanists for information regarding the geographical distribution, local names, abundance, situations, etc., of the following plants: Hydrastis Canadensis, Coptis trifolia, Aconitum uncinatum, A. reclinatum, Xanthorrhiza apiifolia, Actæa spicata, var. rubra, A. alba, Cimicifuga racemosa, C. Americana. Address 180 Elm street, Cincinnati, O.

A BUREAU of scientific information has been formed in Philadelphia, composed of officers and members of the Academy of Science, whose duty shall be the imparting, through correspondence, of precise and definite information upon the different departments of science. The organization is purely voluntary, and should not be imposed upon by trivial questions, or those containing no postage for returning the answer. We notice the following names in various branches of botany: Thomas Meehan, Exotic and Cultivated Plants; J. H. Redfield, Ferns and N. Am. Phænogams; J. T. Rothrock, Vegetable Physiology; F. L. Scribner, Grasses. The Secretary of the Bureau is Prof. Angelo Heilprin, who may be addressed at the Academy of Sciences.

CURRENT LITERATURE.

Synoptical Flora of North America. By Asa Gray, LL. D., etc. Vol. I.—Part II. Caprifoliaceæ-Compositæ. New York: Ivison, Blakeman, Taylor & Co.

Botanists will have a great sense of relief at the appearance of this very important and very difficult volume. The great order of Compositæ, to which it is chiefly devoted, has long needed a thorough revision by a master, and no one could possibly have had the whole subject so completely in hand as our author. This elaboration of some of our very complex genera of Compositæ is the result of time, and travel, and severe study, and is the matured, as well as probably the most valuable of the many contributions to North American Botany that have issued from Cambridge. To say that it will enhance a reputation already the greatest in American botany seems almost superfluous.

A general key to all the gamopetalous orders prefaces the volume, and in the whole matter of typography there is such an evidence of long experience that it leaves little to be desired. If an American botanist can have but one set of books on systematic botany in his library it should undoubtedly be this. An enumeration of a few of the more striking changes adopted or suggested must occupy the remainder of this notice.

Among the Caprifoliaceæ *Sambucus pubens*, Mx., becomes *S. racemosa*, L.; Symphhoricarpus must end in "os," *S. montanus* of the west becoming *S. oreo-*

philus, Gr.; the western form of the southern *Loncera flava* is *L. Sullivantii*, Gr., which latter name will replace the former in our northern manuals; while *L. parviflora*, Lam., is now *L. glauca*, Hill.

The Rubiaceæ receive an accession in a monotypic African genus, Pentodon, to which *Oldenlandia Halei* of Chapm. Fl. has been referred; while Borreria disappears, its species appearing under Spermacoce; and the var. *montanum* of *Galium circæzans* is the *G. Kamtschaticum* of Steller.

Among the Valerians Tournefort's genus Valerianella appears, absorbing both Fedia and Plectritis; *F. Fagopyrum* becoming *V. chenopodifolia*, DC.; and *F. umbilicata* and *F. patellaria* varieties of *V. Woodsiana*, Walp.

Our North American Compositæ number 237 genera, containing 1,610 species, of which 1,551 are indigenous. By far the largest and most difficult genus is Aster, numbering 124 species, all natives, and as there is no real line of division between Aster and Erigeron, with its 70 indigenous species, this group of nearly 200 species represents the most successful North American group of the most successful phænogamous order. In fact the tribe Asteroideæ containes nearly one-third of our Compositæ, the three largest genera belonging to it, viz: Aster with 124 species, Solidago 78, and Erigeron 71. The fourth genus in point of size is Senecio, with 57 species, while those containing fewer than 50 species and more than 25 are Aplopappus 43, Artemisia 42, Helianthus 40, Eupatorium 39, Cnicus 37, Bigelovia 31, Brickellia 30, and Coreopsis and Hieracium each 28. The Californian genus Hemizonia has sprung into sudden prominence with 25 species.

The great South American genus Vernonia has but ten species with us, and western botanists will be glad to see additional room given for heretofore puzzling forms in a new variety under *V. Noveboracensis*, called *latifolia*, and a disentanglement from *V. fasciculata* of Nuttall's *V. altissima*, which is not only ranked as a species but given a new variety, *grandiflora*. In the genus Eupatorium, which includes Conoclinium, *E. parviflorum*, Ell., becomes *E. semiserratum*, DC.; *E. pubescens*, Muhl., is Torrey's var. *ovatum* of *E. rotundifolium*; and *E. purpureum* and *E. perfoliatum* each have varieties to dispose of some of their most decided forms. *Liatris pilosa*, Willd., is *L. graminifolia*, var. *dubia*, Gr.; and the genus loses several species belonging to sections raised to generic rank. For instance, *L. odoratissima* and *L. paniculata*, both of Willd., appear as species under the genus Trilisia of Cassini, and *L. fruticosa* is made to commemorate its re-discoverer, Dr. Garber, under the generic name Garberia. The multitudinous western forms of *Chrysopsis villosa* have begun to take shape under nine varieties, which only represent the more marked forms. The rapidly enlarging western genus Aplopappus appears with four new species and eight new varieties, thirty-five of its forty-three species bearing the name of the author. *A. inuloides* has been merged with *A. uniflorus*. In the second genus of the order, Solidago, there was great confusion, and among many changes are the following: *S. virgata*, Mx., is included under *S. stricta*, Ait.; *S. Virgaurea*, var. *humilis* is *S. humilis*, Pursh; *S. thyrsoidea*, E. Meyer, is *S. macrophylla*, Pursh; *S. arguta*, var. *juncea* is *S. juncea*, Ait., with its variety *scabrella*; *S. Muhlenbergii* is included under *S. arguta*; *S. linoides* of the Manual is made a var. of *S. neglecta*; *S. altissima* is *S. rugosa*, Mill.; and *S. gigantea* becomes a var. of *S. serotina*. *Brachychæta cordata* is found in great abundance in S. Indiana, but the old range of E. Kentucky and southward is retained. *Boltonia glastifolia* is merged into *B. asteroides*, L'Her. In the great genus Aster (including Machæranthera and Diplopappus) several Linnæan species subside, among which are *A. linifolius* and *A. miser*, and the old section in which the latter stood has been completely overhauled, so much so that the incautious will become lost in the vexed synonymy, *A. vimineus*, Ell., *A. diffusus*, Ait., each with varieties, *A. Tradescanti*, L., and *A. paniculatus*, Lam., approximately covering the forms heretofore included under *A. Tradescanti* and *A. miser*; *A. paniculatus* also includes *A. simplex*, *A. tenuifo-*

lius of the Manual, and forms of *A. carneus; A. salicifolius*, Ait., also appears, including among others forms of *A. carneus; A. æstivus* becomes *A. junceus*, Ait.; *A. graminifolius*, Pursh, is *Erigeron hyssopifolius*, Mx.; *A. flexuosus*, Nutt, is *A. tenuifolius*, L.; *A. linifolius* of the Manual is *A. subulatus*, Mx.; *A. ericoides*, var. *strictus* of Fl. Colorado, is *A. Porteri;* the genus Machæranthera brings into Aster its old specific names and several new ones; and thirty-five to forty species of recent description show that the west is not without its own forms. Very many other changes under Aster could be noted, but those given will serve to illustrate both the great need and thoroughness of the revision. The first thing noticeable under Erigeron is the change in all specific names from a neuter to a masculine termination; and the eastern botanists will be surprised at the number of western species, many of them of recent description. *Pluchea fœtida* is included under *P. camphorata*. *Antennaria margaritacea* has become an Anaphalis. *Eclipta procumbens* is *E. alba*, Hasskarl. Heliomeris is merged into Gymnolomia, HBK. *Helianthus cinereus*, var. *Sulivantii* is considered a form of *H. doronicoides*, Lam.; *H. microcephalus* is *H. parviflorus*, Bernh. Part of Actinomeris has been included under Verbesina, *A. helianthoides*, Nutt., becoming *V. helianthoides*, Mx. Villanova appears under Bahia. It is already well known that *Maruta Cotula* is an *Anthemis*, and that Leucanthemum is Chrysanthemum. *Artemisia arctica* is *A. Norvegica*, Fries. *Arnica mollis* is *A. Chamissonis*, Less. Senecio is a famous western genus, and its many forms, especially mountain and alpine forms, are very interesting; *S. Elliottii* is included under *S. aureus*, var. *oboratus;* among the forms of *S. aureus*, var. *werneriæfolius* becomes a species of the same name, and var. *alpinus* is *S. petræus*, Klatt; *S. longilobus* and *S. filifolius* are both included under *S. Douglasii*. *Nardosmia palmata* becomes *Petasites palmata*. Under Cnicus (Cirsium), *C. discolor* is made a variety of *C. altissimus*, and *C. Virginianus*, var. *filipendulus* is made a var. of the same species. *Cnicus benedictus* is *Centaurea benedicta*. Krigia includes Cynthia, and *C. Virginica* becomes *K. amplexicaulis*, Nutt. Nabalus is the only American subgenus of Prenanthes; *N. Fraseri* is *P. serpentaria*, Pursh., and *N. nanus* becomes one of its varieties; and a new species from Maine is named *P. Mainensis*. Troximon absorbs Macrorhynchus, and our old friend *Taraxacum Dens-leonis* is *T. officinale*, Weber, with the western *T. palustre* as its var. *lividum*, and a new high alpine form of the Colorado mountains named var. *scopulorum*.

Such are a few of the changes which would especially strike a user of the Manual, many of them already known from previous notices. It will be observed that the author, while accepting in general the decisions of Bentham & Hooker in the *Genera Plantarum*, has thought best to retain some of the original genera, as being a better expression of the facts so far as North America is concerned.

Vacation Cruising in Chesapeake and Delaware Bays. By J. T. Rothrock, M. D. J. B. Lippincott & Co., Philadelphia, 1884. 12mo., 262 pp. Illust.

The author is already well known to the readers of the GAZETTE by his excellent papers on methods of work in the German laboratories. The present volume is the record of a holiday trip taken primarily for recreation. The trained observer, however, can not be abroad without seeing objects of interest, and what is seen is to be commented upon. The comments appropriate to a pleasure trip are bound by no laws of sequence, and we are treated to delightful bits of philosophy, notes on yacht building, topography of the bays, character sketches, historical incidents, and glimpses of scenery; and withal, our author being a pronounced optimist, being becalmed just as a violent storm is approaching, or meeting an obstinate headwind that makes a day's hard labor in vain, does not for a moment lower his good spirits, but, instead, only gives some happy turn to the tenor of his thought. The book is adapted to the reader who wishes to fill up a spare hour, will prove acceptable to

thoughtful persons who desire instruction with their pleasure, and is of special value to all who contemplate assuming the managementof a yacht, or cruising on the bays named.

The botanist will naturally expect to find items of professional interest, from an author so eminent in the science. But the book is a record of a season of recreation in a very complete sense of the word, and all odor of the shop was shaken off before starting. Nevertheless, there are a few excellent botanical notes and comments. The special value of the work to the botanist is to show how he may spend a vacation with the most profit. Indeed, but few readers will lay the book down without a longing to try yachting, or, if living inland, canoeing.

The Essentials of Botany. By Charles E. Bessey, M. Sc. Ph. D. Henry Holt & Co., New York, 1884. 12mo., 292 pp. Illust.

This is one of the Briefer Course text-books, and is essentially an abridgement of the author's larger Botany. The changes, however, are so many and so important that it has the interest of a new work.

A change that will go far toward making the work more popular with both teachers and pupils is the simplification of the language by using fewer technical terms, and substituting English equivalents whenever possible. Thus for parenchyma, collenchyma, sclerenchyma we have soft tissue, thick angled tissue, and stony tissue, and so with other terms. This is extended to the plant names also, as water net for Hydrodictyon, green felt for Vaucheria, white rust for Cystopus, pond scums for Zygnemaceæ, green slimes for Cyanophyceæ, water moulds for Saprolegniaceæ, sac-fungi for Ascomycetes, cup-fungi for Helvellaceæ, mossworts for Bryophyta, fernworts for Pteridophyta, etc. We have only mentioned the most prominent. Among the other innovations is the substitution of Zygophyta, Oophyta, Carpophyta for Zygosporeæ, Oosporeæ and Carposporeæ, which makes the terms uniform with Protophyta, Bryophyta, etc., a change to be commended.

It is a pleasure to find that instead of trying to compress all the larger work into this, the author has given a readable statement of those important topics which lie at the basis of the science, in fact the "essentials of botany."

A valuable feature of the larger book was the directions for laboratory work. This has been much extended under the title of practical studies, and is now placed under every subject in the book, including the physiological part.

Among the minor changes are the employment of thicker leads, and sparing use of italics, which make more inviting pages to the eye. Quite a number of the cuts have not appeared in the larger work, and the failure to acknowledge the source of these must have been an oversight.

No text book ever gave better promise of meeting a long felt want than this. It will be welcomed wherever the aim is to learn from nature herself, and to make the book serve only as *a guide.*